

Q1. Salient features of tropical cyclone:-

- (a) the areas of low pressure zones surrounded by high pressure ones.
- (b) are formed between $10-30^{\circ}$ latitude.
- (c) When formed over sea carry high amounts of moisture.
- (d) On the Indian sub-continent become stronger during south-west monsoon.
- (e) They move along with movement of ICTZ.
- (f) In the northern hemisphere have anti-clockwise rotation & vice-versa in the south.

The effect of tropical cyclones is often destructive in India especially in coastal regions of Orissa, north AT & West Bengal & also on Gujarat coast. The reason for this destruction are:-

- (a) Inadequate mitigation measures like cyclone shelters are not taken.
- (b) Inadequate rehabilitation post cyclone leads to the poor making cheap arrangements that are destructive.

(c) In urban areas bad planning leads to massive flooding & accompanied ~~to~~ loss

(d) Little awareness about disaster preparedness among general population.

Conclusion: Past years experience in dealing with cyclone Phailin has demonstrated that proper disaster management can ~~decrease~~ reduce the damage done by cyclones in India.

Q2

Feedback effects of water vapour:-

- (a) Water vapour has ability to store large amount of heat through the property of latent heat of vapourisation.
- (b) Thus, increased amount of water vapour increases heat content of atmosphere.
- (c) Thus, it acts as a positive feedback mechanism in warming.

Feedback effects of snow & ice cover:-

- (a) Increased snow & ice leads to reflection of sunlight back out ~~of~~ from the surface.
- (b) Thus, higher ice cover acts as a negative feedback because of reduced albedo.

Feedback from clouds:-

- (a) Clouds play a dual role, while thick cloud cover ~~re~~ reduces the intensity of sunlight coming to the atmosphere, it also traps heat & prevents its escape from the

atmosphere.

(b) Thus, the degree of feedback depends on intensity of cloud cover & intensity of sun light.

Q3. The 'Issue of loss & damage' in climate talks refers to the economic consequences of global climate change. It is argued by climate change economists that :-

- (a) Adverse environment effects may ~~be~~ increase with climate change causing economic losses which might be more severe for developing nations.
- (b) Climate change may lead to reduced productivity & economic output.

The issue of 'loss & damage' is being taken up by developing nations which argue that ~~because~~ because, developed nations during industrialization have contributed to climate change - a global common, they must make compensation for the same. This is in the same vein as the arguments about common but differentiated responsibilities.

Loss & Damage as Third Pillar

- (i) While mitigation and adaptation are 'essential' for ^{to} climate change, they cannot be borne equally by all nations.
- (ii) It is the prerogative of developed nations to make allowances for developing countries through reduced emission requirements, transfer of technology & for future disasters.
- (iii) Thus, the third pillar aims at cooperative & sustainable development to allow developing nations a chance to grow.

Q4. The issue of GM crop trials is much debated because it aims to balance food security concerns with that of a maintaining environmental stability.

Major issues with GM crops:-

- (i) During testing stage, one cannot be sure how it would effect the biodiversity of a region.
- (ii) There is worry that GM crops may function like exotic ~~sepi~~ species & harm the ecological balance by affecting pollination, weed growth, bird & bee population etc.
- (iii) There is also worry of contamination of nearby areas.
- (iv) As GM crops have an artificial genome in them, it cannot be insured that this genome does not adversely effect other organisms not thought of during design.
- (v) Another economic concern also deals with the fact that GM crops usually have a terminator gene, which makes seeds from these crops unviable. Thus, a farmer is

dependent on seed manufacturer for each crop.

Why GM crops are required?

- (i) GM crops are designed to provide favourable characteristics to crops such as short time, higher yields, pest resistance, nutritional supplements etc.
- (ii) With concerns for food security, GM crops can be the solution especially with decreasing ~~and~~ agricultural lands.

Should GM crops be allowed?

The need for GM crops is necessary. However, necessary ~~and~~ regulations must be placed for their safe usage. Thus, they need to go through scientific testing before commercial use. The strengthening of legislations like National Biotechnology Authority Bill along with coordination between institutions like ICAR & civil society is essential.

Q 5(a) (i) Ozone holes are formed due to ~~the~~ breakdown of O_3 into O_2 .

(ii) Ozone is a greenhouse gas, necessary to trap incoming solar radiation in the earth's atmosphere without which a habitable temperature cannot be maintained.

(iii) Thus, ozone holes ~~where~~ would lead to slight cooling. ~~They~~ Ozone is however essential as it blocks harmful UV rays from ~~reaching~~ coming to the earth's surface & to maintain ~~the~~ good atmospheric condition.

Q5(b) (i) Disaster can be defined as any catastrophic event which causes severe human and economic losses. Disaster prevention planning aims at reducing such losses.

(ii) Use of S&T in prevention:-

- (a) To detect or forecast natural disaster to prepare for mitigation measures.
- (b) Understand of natural disasters can also allow for putting in place technical solution like barriers in floods etc.
- (c) In man-made disasters like the Bhopal gas tragedy, S&T can work towards making safer options for disaster prevention.

Q6.

The Fukushima disaster led to many countries doubting the effectiveness & safety of nuclear energy. Many countries like ~~Germany~~ Germany also put blanket ban on use of nuclear energy. But can it be used to justify excess use of fossil fuels? The answer for which is no:-

- (a) Germany, for example has increased its use of sustainable energy like wind & solar energy in its nuclear basket.
- (b) India has not shifted its stance from ~~use of~~ ~~the~~ increasing use of nuclear energy, but has push for greater liability ~~to~~ nuclear supplier in (NSG). Moreover, it's taken steps to increase sustainable energy use especially solar.

However, coal & remains to be a cheap source of energy & India has large reserves of it. Thus, there remains high demand for ~~fossil~~ fossil fuels as other energy sources are expensive & require capacity ~~for~~ generation.

Availability of coal in India

- (i) India has large ~~reserves~~ reserves of low grade like lignite & bituminous but does not have reserves of high grade coking coking coal.
- (ii) Indian reserves are concentrated in the Chotanagpur plateau region, Meghalaya plateau & small amounts in Tamil Nadu

Coal Resources around the world :-

- (i) North America - Around Great Lakes Region.
- (ii) England - In South Hampshire & Manchester.
- (iii) Germany - In Black Forest region in Saar area
- (iv) ~~Go~~ Russia - Urals & western Siberia.
- (v) Australia has great reserves of high quality coal in eastern & southern coastal areas

Conclusion - With increasing demand for fossil fuels it is estimated they would finish by 2050.

Q7. Reasons for fire accidents in trains :-

- (a) A large number of trains still run on diesel engines which are combustible.
- (b) Despite warning & specific prohibitions passengers carry inflammable goods like kerosene, cigarettes, matches etc.
- (c) Increased use of electrical equipments, though the capacity to sustain such use & because of old & poor quality machines leads to ~~the~~ ~~the~~ electric fires.
- (d) Lack of ~~the~~ fire detection & containment measures ~~that~~ lead to spread of fires.

Remedies to mitigate fire accidents :-

- (a) Railway modernisation with shift to electric engines & upgradation of electrical machines like motors & generators on board.
- (b) Strict implementation of fire safety policy & not allowing passengers to carry inflammable goods through trains.
- (c) Working fire alarms & automatic sprinkler systems on board.

Q8 Greenhouse effect is the warming of earth's atmosphere by trapping sun's reflected rays (heat) by atmospheric gases. This is similar to heating up of a greenhouse which allows sunlight in but does not allow energy rays to escape.

Important Greenhouse gases:-

- (a) CO_2 (c) H_2O (vapour) (e) NO_2
- (b) CH_4 (d) O_3

Environmental impact of $\uparrow$ greenhouse gases:-

- (a) Global warming.
- (b) Reduction in biodiversity.
- (c) Reduction in ~~avg~~ agricultural productivity in some areas.
- (d) Increase in adverse climatic effects like cyclones, floods, droughts etc.

~~Q9~~ Economic Impact

- (a) ~~Q9~~ Decreased productivity of humans because of heat.
- (b) Increased cooling costs.
- (c) ~~Q9~~ Reduced agri-productivity will

Q 9) (i) Flood plains are formed because of seasonal flooding of river valleys with increase in river flow & water ~~volumes~~ volumes.

(ii) Flood plains are formed due to simultaneous ~~to~~ erosion ~~to~~ & deposition.

⊗ Erosion of flood plain areas leads to ~~flattening~~ flattening of land. In region with slower flow rates, rivers deposit sediments & debris it was carrying with it.

(iii) Outer regions of flood plains thus usually have rougher sand & pebbles called Khaddon in India, while areas near the river source see deposition of fine alluvium (Bangar)

Economic advantage of living in flood plains

These regions have very high soil fertility because of yearly renewal of alluvium.

They are also moisture rich & do not require external irrigation. These areas thus form regions with the highest agricultural productivity.

downstream effects on all economic activities.

Social Impact

- (i) stress migrations because of disasters or land inundation.
- (ii) Increased inequality in society as the poor would find it even more difficult to escape ~~the~~ rehabilitate after disasters

Q10) Source of air pollution:-

- (a) Industrial emissions
- (b) Vehicular emission.
- (c) Incomplete ~~for~~ burning of fossil fuels & traditional domestic fuels.

Effect on living organisms:-

- (a) lower productivity of plants due to increased particulate matter & effect on soils due to acid rain.
- (b) Respiratory illnesses like asthma, bronchitis.
- (c) Issues with vision & eye diseases.

Measures to control air pollution:-

- (a) Particulate separator in industries & vehicles.
- (b) Recycling of emitted air for other purposes.
- (c) Raising awareness about sustainable energy.
- (d) Strict pollution norms.

(c) Implementation of environment acts &
as fines & cess for use of fossil
fuels.

- Q 11)
- (i) Africa's backwardness belies its great natural resources. This is mainly because of its history of colonial rule & ~~the~~ high ^{ethnic} tribal tension which has prevented growth & development.
 - (ii) Unlike in India, imperialist powers did not bring any educational reforms, thus, scientific developments in the rest of the world did not reach the African continent.
 - (iii) Moreover, Africa was seen more as a area for raw materials & no industrial development took place in the region.
 - (iv) Lack of capital & infrastructure has also made it difficult for African countries to exploit its natural resources.
 - (v) Moreover, ethnic tensions among rival tribes has led to many human rights violation & wars leading to little stability, to allow for growth & development in the continent.

Q 12(a) (i) Ocean currents are large scale movement of water masses along continental boundaries in oceans. These movements are affected by changes in density & temperature, ~~among~~ rotation of earth etc.

(ii) Effect on coastal areas

(a) Ocean currents are of two types cold currents & warm current.

(b) Cold currents lead to decrease in temperature of ~~water~~ coastal region.

eg - The Peruvian current ~~to~~ leads to significant lowering to coastal Peru.

They also play a major role in formation of deserts as cold currents are generally moisture deficient. Thus major deserts like Sahara, Mojave, Atacama are along cold currents like Canary, California & Humboldt current.

(c) Warm current are usually moisture laden and cause increase in both temperature & precipitation in coastal areas.

eg - Western Europe is significantly warm because of the North Atlantic drift current.

Q 12(b)

Effect of salinity

Water masses move from regions with less salinity to that with more salinity.

As ocean surfaces tend to be ~~be~~ more saline due to continuous evaporation, water from lower levels keeps moving up.

Effect of temperature on stratification

Cold ocean water tends to sink, while warm water rises. This leads to significant stratification of ocean water w.r.t temperature. However, in polar regions this is disturbed because of freezing of water, leading to a more uniform water stratification.

Q13) The 3Rs of disaster management consists of Relief, Rehabilitation and ^{Reconstruction} Recovery.

The emphasis on their continuity is with regard to their short term & long term significance in post crisis time.

Relief is the immediate attention or steps taken post disaster. It involves rescue of individual & making ^{available} provisions ~~to~~ ^{& disease prevention} such as food, water & shelter. It usually involves many external actors as the people are ~~so~~ themselves dealing with the disaster.

Rehabilitation includes medium term planning so as to allow disaster victims to slowly move back into their old situation. It involves steps to ~~bring~~ restart economic & social activity in the region. It involves both local administration & voluntary organisations.

Reconstruction involve rebuilding of lost infrastructure & must also include disaster mitigation & prevention steps. As it generally involves the change in societal setup post rehabilitation it ideally requires community participation.

All three Rs are essential for DM. Their continuity is also essential to avoid further economic & social losses, to prevent community disenchantment & for sustainable growth. If the entire cycle of 3Rs is not followed it leave the one vulnerable to further disasters.

Q14(a) 'Crisis Mapping' involves identification (material & societal) of risk level of all components that could be affected in a disaster & prioritize how disaster management should be taken up for most efficient recovery.

Examples:-

- (a) Identification of weak embankment during crisis mapping can help strengthening it for disaster mitigation.
- (b) Identification of community most susceptible to disaster during mapping can be prioritized in planning of relief operation

Q 15) A proper Disaster Management planning during cyclone Phailin resulted in significantly lower economic losses & human losses as compared to the 1999 super cyclone.

What was done differently?

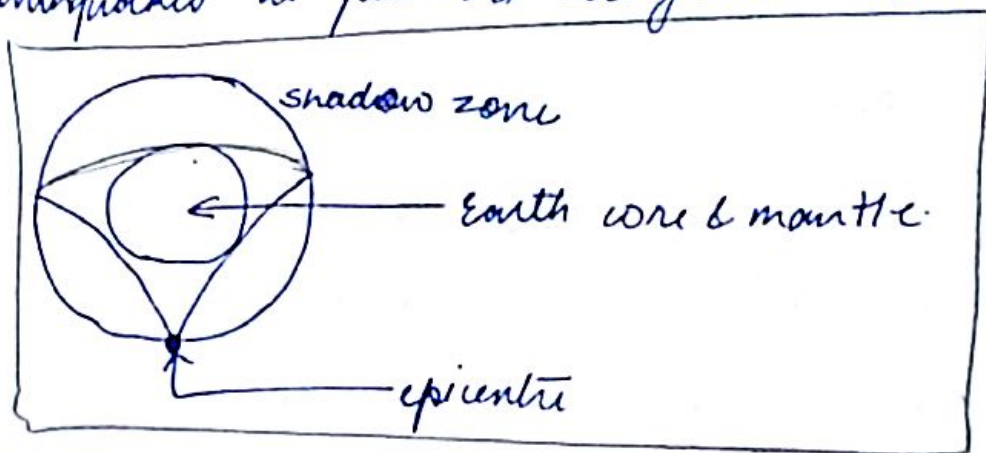
- (i) Stronger institutions - The State Disaster Management Authority had become functional & had ~~done~~ prepared a proper DM plan. The work of different bodies like District Magistrate, Police & Army had be predecide.
- (ii) Trained Personnel - The Army & its special National Disaster Response force had been specially trained to relief & rehabilitation.
- (iii) Use of warning systems & community awareness - The community had been trained on course of action to be taken in case of disaster warning. This was aided by proper disaster forecasting by MET department.
- (iv) Cyclone shelters equipped with food & water - Designated cyclone shelters had been created for providing safe harbour to people.

- (v) efficient Centre - State coordination for proper implementation of funds.
- (vi) Proper distribution of rehabilitation funds for fast moving.

16 Reasons for inadequate disaster ~~prep~~ preparedness after Disaster Management Act, 2005:-

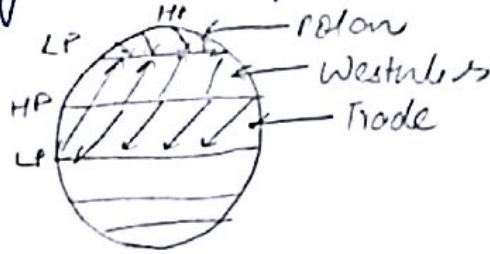
- (a) The National Disaster Management Authority is not function. The members of NDMA do not have regular meeting nor are they chosen based on expertise in disaster management.
- (b) Many states have not set up SDMA.
- (c) There is no accountability for ~~prep~~ preparation of disaster plans.
- (d) At district level, the DM is overtaxed with other work.
- (e) Lack of funds to NDMA has led to lower ~~prep~~ preparedness.
- (f) Large scale corruption & leakages in disaster funds.
- (g) Inadequate state capacity to deal with disaster management.

Q17) (i) While P-waves in an earthquake can travel through all types of medium, S-waves ~~are~~ are surface waves & can only travel through solid ~~surf~~ medium. This leads to shadow zones in earthquakes as per the diagram below



(ii) The Earth's mantle is liquid. Depending on ~~spot~~ spread of S waves & deflection of P waves the limits of the earth's mantle can be calculated. Deflection of waves from the core provides the necessary information of earth's core (Nife)

- Q18) The earth has major ~~and~~ wind belts
- Trade winds, westerlies & polar winds.
based on the high & low pressure areas
on the earth.



The shifting of wind belts takes place
due to shift of low pressure (& high pressure)
zones due to ~~shift in~~ change in seasons

For example, the Inter-tropical convergence
zone (ITCZ) shifts north in the summer
(as it is a low pressure) one and
significant climatic impact.

In the Indian sub-continent, the ITCZ
shifts over the northern plains ^{in the summer} leading
to arrival of the S-W monsoon in the
region.

Similarly, in the winter, in the Mediterranean
region, there is a southern shift in the
temperate high pressure zone which leads
to winter rainfall in the region

Q20 a) Coral bleaching refers to the discoloration & degradation of corals due to increased acidification of sea water increased dissolution of atmospheric CO_2 .

Coral bleaching leads to ~~dest~~ irreversible destruction of corals which leads to reduced biodiversity in the region. Sea acidification also impacts the ^{the} habitat created by the corals. This also impacts intensity of sea tides.

The corals are significantly affected by increase in sea temperature & lowering of water pH:

Q 206) The national river linking projects aims to join the network of the perennial Himalayan rivers in the north with the seasonal rivers in Deccan plateau area. This aims to reduce the water wasted as the freshwater goes into the sea.

Advantages

- (i) creates a robust irrigation system
- (ii) Reduces possibility of drought.
- (iii) Reduces dependence on monsoons in agriculture
- (iv) Greater agricultural productivity

Disadvantages

- (i) Environment impact of the linking cannot be forecasted.
- (ii) Might adversely affect biodiversity.
- (iii) Large economic cost of project.
- (iv) Effluent / contamination of ground water is possible

Q21) Multinational companies are looking to Asia for the following reasons:-

- (a) Search for new markets - Because of economic downturn in America & Western Europe & increased economic growth in Asian countries along with large populations.
- (b) Cheap labour - China has developed itself into a manufacturing hub while India, Indonesia aims at attracting higher foreign capital by developing themselves as service hubs.
- (c) Rise of the Asian tigers i.e. South Korea, Taiwan, Indonesia, Malaysia etc have ~~treated~~ large capitals for investments.

However, not all MNCs are looking to shift as a majority of innovation & R&D continues to happen in the developed world. The buying capacity in those regions would continue to let them remain as the main focus of investment.

Q 22) (i) The middle eastern countries like Saudi Arabia, UAE, Iraq, Iran, Syria, Lebanon have large petroleum reserves & ^{is} ~~are~~ the main stay of their economic.

(ii) In India also, large petroleum reserves have been discovered in Bikaner leading to a shift of economic activity in the region.

(iii) In north America, the desert areas in have large reserves of mica & copper (salt lake city) ~~to~~ which has led to transformation of these bad lands.

(iv) Similarly, there has been a transformation of cold deserts like Siberia since the discovery of petroleum in the region.

(v) & Also, discovery of uranium in Australian deserts is expected to have great economic impact in the region.

Q 23) Tsunamis are large tidal waves that can have a devastating effect on coastal region.

Mitigation measures :-

- (a) Tsunami Warning System - They are usually generated due to underwater earthquakes & travel hundreds of miles before meeting continental lands. Thus, a warning system can effectively allow evacuation of people & property in danger zones.
- (b) Tsunami Walls - These are high walls on coast to prevent flooding of coastal areas & contain sea water.
- (c) Wave breakers can also be placed offshore to reduce the wave generation in shallow waters.

Global Mechanism - An Indian ocean Tsunami warning system has been developed by placing multiple sensors in deep water. These are continuously monitored by various meteorological & oceanographic institutions in partner

nations.

Technological measures:-

- (a) Earthquake sensors.
- (b) Satellite imaging to measure movement of tsunami waves.
- (c) Deep ocean sensors to detect tidal waves.

Q24) (i) Polar Vortex is a low pressure zone extending from the upper troposphere into the stratosphere.

(ii) These develop over polar regions of both the Northern & Southern Hemisphere.

In the Arctic region there are two major polar vortices; one around Gaffin Island, Canada & the second around Siberia.

(iii) Polar Vortices strengthen during winter & weaken in summer. The weakening of polar vortex in ~~some~~ winter causes intense cold waves in the region.

(iv) A strong polar vortex extending into the stratosphere causes ozone depletion or formation of ozone holes. This is especially strong during spring time in the Antarctic polar vortex in the southern hemisphere.

Q 25 Factors for centralization of IT industry:-

- (a) Skilled / Trained workforce available.
- (b) Development of urban centres with decent power supply.
- (c) Strengthening of broadband internet connectivity for global access.
- (d) Cheap workforce for back-end testing & verification.

Shortcomings:-

- (a) Lack of electronic industries & capabilities to create IT manufacturing in India.
- (b) Inefficient quality control standards.